

WHAT IS CLAIMED IS:

1. A recording apparatus for recording an audio signal and a video signal on an information recording medium, comprising:

video packetized elementary stream packet generating means for generating video packetized elementary stream packets by dividing a video elementary stream in which a video signal is compressed and coded according to a predetermined method by a predetermined number of video frames and by adding a header;

audio packetized elementary stream packet generating means for generating audio packetized elementary stream packets by dividing an audio elementary stream in which an audio signal is compressed and coded according to a predetermined method by a predetermined number of audio frames and by adding a header;

video packetized elementary stream packet unit generating means for generating a video packetized elementary stream packet unit by combining a predetermined number of the video packetized elementary stream packets;

audio packetized elementary stream packet unit generating means for generating an audio packetized elementary stream packet unit by combining the audio packetized elementary stream packets corresponding to the

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video packetized elementary stream packet unit;

sync block generating means for generating sync blocks by alternately disposing the video packetized elementary stream packet unit and the audio packetized elementary stream packet unit and by converting the video packetized elementary stream packet unit and the audio packetized elementary stream packet unit into a predetermined recording format; and

recording means for recording the sync blocks on said information recording medium.

2. A recording apparatus according to claim 1, wherein the predetermined method for compressing and coding the video signal and the predetermined method for compressing and coding the audio signal are MPEG methods.

3. A recording apparatus according to claim 1, wherein said video packetized elementary stream packet generating means generates the video packetized elementary stream packets by dividing the video elementary stream by one video frame, and by adding the header in which at least one of a presentation time stamp and a decoding time stamp is recorded.

4. A recording apparatus according to claim 1, wherein

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said audio packetized elementary stream packet generating means generates the audio packetized elementary stream packets by dividing the audio elementary stream by one audio frame, and by adding the header in which at least a presentation time stamp is recorded.

5. A recording apparatus according to claim 1, wherein said audio packetized elementary stream packet unit generating means generates the audio packetized elementary stream packet unit by combining the audio packetized elementary stream packets having a presentation time stamp which is after the earliest value of the presentation time stamps recorded in the headers of the video packetized elementary stream packets forming the current video packetized elementary stream packet unit and which is before the earliest value of the presentation time stamps recorded in the headers of the video packetized elementary stream packets forming the subsequent video packetized elementary stream packet unit.

6. A recording apparatus according to claim 1, further comprising separation means for separating a transport stream in which the compressed and coded video signal and the compressed and coded audio signal are multiplexed into the video elementary stream and the audio elementary stream.

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7. A recording apparatus according to claim 6, wherein said sync block generating means generates the sync block whose data type is AUX by using transport stream packets of program specific information included in the transport stream.

8. A recording apparatus according to claim 1, wherein said sync block generating means generates the sync block by recording identification information indicating the data type of the sync block in a header of the sync block.

9. A recording apparatus according to claim 8, wherein the identification information at least indicates whether the data type of the sync block is the video packetized elementary stream packet, the audio packetized elementary stream packet, or a transport stream packet.

10. A recording apparatus according to claim 1, wherein said sync block generating means records a flag indicating whether a data area of the sync block is totally occupied with effective data in a header of the sync block, and, when the data area of the sync block is not totally occupied with the effective data, a data length of the effective data is recorded in a head of the data area.

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11. A recording method for use in a recording apparatus which records an audio signal and a video signal on an information recording medium, comprising:

a video packetized elementary stream packet generating step of generating video packetized elementary stream packets by dividing a video elementary stream in which a video signal is compressed and coded according to a predetermined method by a predetermined number of video frames and by adding a header;

an audio packetized elementary stream packet generating step of generating audio packetized elementary stream packets by dividing an audio elementary stream in which an audio signal is compressed and coded according to a predetermined method by a predetermined number of audio frames and by adding a header;

a video packetized elementary stream packet unit generating step of generating a video packetized elementary stream packet unit by combining a predetermined number of the video packetized elementary stream packets;

an audio packetized elementary stream packet unit generating step of generating an audio packetized elementary stream packet unit by combining the audio packetized elementary stream packets corresponding to the video packetized elementary stream packet unit;

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a sync block generating step of generating sync blocks by alternately disposing the video packetized elementary stream packet unit and the audio packetized elementary stream packet unit and by converting the video packetized elementary stream packet unit and the audio packetized elementary stream packet unit into a predetermined recording format; and

a recording step of recording the sync blocks on said information recording medium.

12. A recording medium for storing a computer-readable program used for recording an audio signal and a video signal on an information recording medium, said computer-readable program comprising:

a video packetized elementary stream packet generating step of generating video packetized elementary stream packets by dividing a video elementary stream in which a video signal is compressed and coded according to a predetermined method by a predetermined number of video frames and by adding a header;

an audio packetized elementary stream packet generating step of generating audio packetized elementary stream packets by dividing an audio elementary stream in which an audio signal is compressed and coded according to a predetermined method by a predetermined number of audio

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frames and by adding a header;

a video packetized elementary stream packet unit generating step of generating a video packetized elementary stream packet unit by combining a predetermined number of the video packetized elementary stream packets;

an audio packetized elementary stream packet unit generating step of generating an audio packetized elementary stream packet unit by combining the audio packetized elementary stream packets corresponding to the video packetized elementary stream packet unit;

a sync block generating step of generating sync blocks by alternately disposing the video packetized elementary stream packet unit and the audio packetized elementary stream packet unit and by converting the video packetized elementary stream packet unit and the audio packetized elementary stream packet unit into a predetermined recording format; and

a recording step of recording the sync blocks on said information recording medium.

13. A recording apparatus for recording an audio signal and a video signal on an information recording medium, comprising:

video editing unit generating means for generating a video editing unit by dividing a video elementary stream in

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which a video signal is compressed and coded according to a predetermined method by a predetermined number of video frames;

audio editing unit generating means for generating an audio editing unit by dividing an audio elementary stream in which an audio signal is compressed and coded according to a predetermined method by a predetermined number of audio frames;

time stamp addition means for adding a time stamp indicating a playback timing to each of the video editing unit and the audio editing unit;

sync block generating means for generating sync blocks by alternately disposing the video editing unit with the time stamp and the audio editing unit with the time stamp and by converting the video editing unit and the audio editing unit into a predetermined recording format; and

recording means for recording the sync blocks on said information recording medium.

14. A recording method for use in a recording apparatus which records an audio signal and a video signal on an information recording medium, comprising:

a video editing unit generating step of generating a video editing unit by dividing a video elementary stream in which a video signal is compressed and coded according to a

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predetermined method by a predetermined number of video frames;

an audio editing unit generating step of generating an audio editing unit by dividing an audio elementary stream in which an audio signal is compressed and coded according to a predetermined method by a predetermined number of audio frames;

a time stamp addition step of adding a time stamp indicating a playback timing to each of the video editing unit and the audio editing unit;

a sync block generating step of generating sync blocks by alternately disposing the video editing unit with the time stamp and the audio editing unit with the time stamp and by converting the video editing unit and the audio editing unit into a predetermined recording format; and

a recording step of recording the sync blocks on said information recording medium.

15. A recording medium for storing a computer-readable program used for recording an audio signal and a video signal on an information recording medium, said computer-readable program comprising:

a video editing unit generating step of generating a video editing unit by dividing a video elementary stream in which a video signal is compressed and coded according to a

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predetermined method by a predetermined number of video frames;

an audio editing unit generating step of generating an audio editing unit by dividing an audio elementary stream in which an audio signal is compressed and coded according to a predetermined method by a predetermined number of audio frames;

a time stamp addition step of adding a time stamp indicating a playback timing to each of the video editing unit and the audio editing unit;

a sync block generating step of generating sync blocks by alternately disposing the video editing unit with the time stamp and the audio editing unit with the time stamp and by converting the video editing unit and the audio editing unit into a predetermined recording format; and

a recording step of recording the sync blocks on said information recording medium.

16. A playback apparatus for converting an audio signal and a video signal recorded on an information recording medium as packetized elementary stream packets into a transport stream, comprising:

reading means for reading the packetized elementary stream packets from said information recording medium;

initializing means for initializing a system time clock

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by using one of a decoding time stamp and a presentation time stamp included in a header of each of the packetized elementary stream packets;

first generation means for generating a program clock reference packet by using a value of the system time clock which is read at predetermined intervals; and

conversion means for converting the packetized elementary stream packets into transport stream packets while synchronizing a time obtained by delaying the system time clock by a predetermined period with a time indicating the decoding time stamp or the presentation time stamp included in the header of each of the packetized elementary stream packets.

17. A playback apparatus according to claim 16, wherein said initializing means initializes the system time clock by using a value obtained by subtracting a predetermined period from the decoding time stamp or the presentation time stamp included in the header of the packetized elementary stream packet to be first read, and said first generation means starts generating the program clock reference packet earlier by a predetermined period than a time at which the packetized elementary stream packet to be first read is converted into the transport stream packet by said conversion means.

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18. A playback apparatus according to claim 16, further comprising second generation means for generating a program association table packet and a program map table packet, wherein said second generation means starts generating the program association table packet and the program map table packet earlier by a predetermined period than a time at which said first generation means starts generating the program clock reference packet.

19. A playback apparatus according to claim 16, wherein said conversion means converts the packetized elementary stream packets of the video signal into the transport stream packets while synchronizing a time obtained by delaying the system time clock by vbv_delay included in a picture header with the time indicating the decoding time stamp or the presentation time stamp included in the header of each of the packetized elementary stream packets.

20. A playback apparatus according to claim 16, wherein said conversion means converts the packetized elementary stream packets of the video signal into the transport stream packets at a fixed rate, and intermittently outputs the transport stream packets.

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21. A playback apparatus according to claim 16, wherein said conversion means converts the packetized elementary stream packets of the video signal into the transport stream packets at a variable rate, and outputs the transports stream packets at regular intervals.

22. A playback apparatus according to claim 16, wherein said conversion means converts the packetized elementary stream packets of the audio signal into the transport stream packets while synchronizing a time obtained by delaying the system time clock by a predetermined period with a time indicating the presentation time stamp included in the header of each of the packetized elementary stream packets of the audio signal.

23. A playback method for use in a playback apparatus which converts an audio signal and a video signal recorded on an information recording medium as packetized elementary stream packets into a transport stream, comprising:

a reading step of reading the packetized elementary stream packets from said information recording medium;

an initializing step of initializing a system time clock by using one of a decoding time stamp and a presentation time stamp included in a header of each of the packetized elementary stream packets;

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a first generation step of generating a program clock reference packet by using a value of the system time clock which is read at predetermined intervals; and

a conversion step of converting the packetized elementary stream packets into transport stream packets while synchronizing a time obtained by delaying the system time clock by a predetermined period with a time indicating the decoding time stamp or the presentation time stamp included in the header of each of the packetized elementary stream packets.

24. A recording medium for storing a computer-readable program used for converting an audio signal and a video signal recorded on an information recording medium as packetized elementary stream packets into a transport stream, said computer-readable program comprising:

a reading step of reading the packetized elementary stream packets from said information recording medium;

an initializing step of initializing a system time clock by using one of a decoding time stamp and a presentation time stamp included in a header of each of the packetized elementary stream packets;

a first generation step of generating a program clock reference packet by using a value of the system time clock which is read at predetermined intervals; and

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25. A recording apparatus for recording a plurality of data streams on an information recording medium, comprising:
dividing means for generating sync blocks by dividing each of the data streams, which consists of packets, according to a predetermined data length;

recording means for mixing the sync blocks generated from the different types of data streams and for recording the sync blocks on said information recording medium.

26. A recording apparatus according to claim 25, wherein said providing means provides a discontinuous count value to the sync block in case of the occurrence of an error in the corresponding data stream.

27. A recording apparatus according to claim 25, wherein said data streams are packetized elementary streams.

28. A recording apparatus according to claim 25, wherein said data streams are transport streams.

29. A recording apparatus according to claim 28, wherein said dividing means generates the sync blocks by dividing a transport stream packet into a first part and a second part, and said providing means provides the count value to one of the sync block generated from the first part of the transport stream packet and the sync block generated from the second part of the stream packet.

30. A recording method for use in a recording apparatus which records a plurality data streams on an information recording medium, comprising:

a dividing step of generating sync blocks by dividing each of the data streams, which consists of packets, according to a predetermined data length;

a providing step of providing identification information indicating the type of each of the data streams and a count value for identifying the order of the identical type of data streams to each of the sync blocks; and

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a recording step of mixing the sync blocks generated from the different types of data streams and recording the sync blocks on said information recording medium.

31. A recording medium for storing a computer-readable program used for recording a plurality of data streams on an information recording medium, said computer-readable program comprising:

a dividing step of generating sync blocks by dividing each of the data streams, which consists of packets, according to a predetermined data length;

a providing step of providing identification information indicating the type of each of the data streams and a count value for identifying the order of the identical type of data streams to each of the sync blocks; and

a recording step of mixing the sync blocks generated from the different types of data streams and recording the sync blocks on said information recording medium.

32. A playback apparatus for playing back data streams recorded on an information recording medium, comprising:

reading means for reading sync blocks from said information recording medium;

extraction means for extracting identification information indicating the type of each of the data streams

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and a count value for identifying the order of the identical type of data streams from the sync blocks read by said reading means;

playback means for playing back the data streams by using the sync blocks read by said reading means based on the identification information and the count value extracted by said extraction means; and

insertion means for detecting the occurrence of an error based on the count value extracted by said extraction means and for inserting error information into the data stream played back by said playback means.

33. A playback method for use in a playback apparatus which plays back data streams recorded on an information recording medium, comprising:

a reading step of reading sync blocks from said information recording medium;

an extraction step of extracting identification information indicating the type of each of the data streams and a count value for identifying the order of the identical type of data streams from the sync blocks read in said reading step;

a playback step of playing back the data streams by using the sync blocks read in said reading step based on the identification information and the count value extracted in

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said extraction step; and

an insertion step of detecting the occurrence of an error based on the count value extracted in said extraction step and inserting error information into the data stream played back in said playback step.

34. A recording medium for storing a computer-readable program used for playing back data streams recorded on an information recording medium, said computer-readable program comprising:

a reading step of reading sync blocks from said information recording medium;

an extraction step of extracting identification information indicating the type of each of the data streams and a count value for identifying the order of the identical type of data streams from the sync blocks read in said reading step;

a playback step of playing back the data streams by using the sync blocks read in said reading step based on the identification information and the count value extracted in said extraction step; and

an insertion step of detecting the occurrence of an error based on the count value extracted in said extraction step and inserting error information into the data stream played back in said playback step.

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